SPECIFICATION

TITLE OF THE INVENTION

CLEANER

BACKGROUND OF THE INVENTION

Field of the Invention:

The present invention relates to a cleaner.

Description of the Related Art:

Conventionally, a steam cleaner has been provided for removing dirt from walls, floors, window glass, and the like. The steam cleaner functions as follows: water fed from a water tank is heated by a heater to thereby be formed into steam, and the steam is jetted through a nozzle toward a wall, a floor, window glass, or the like, thereby loosening dirt by means of steam.

However, the conventional steam cleaner involves the following problem: after dirt is loosened by means of steam, if the wall, floor, window glass, or the like is left intact, the dirt again sticks to the wall, floor, window glass, or the like. Therefore, the dirt loosened by means of steam must be immediately wiped off with a towel or the like, thus involving troublesome work.

SUMMARY OF THE INVENTION

An object of the present invention is to solve the above-mentioned problem involved in the conventional steam cleaner and to

provide a cleaner that eliminates the need to wipe off dirt loosened by means of steam with a towel or the like, to thereby simplify cleaning work.

To achieve the above object, a cleaner of the present invention includes a cleaning-medium-containing section for containing a cleaning medium; a medium-transmitting section for transmitting the cleaning medium; a heating section for heating the cleaning medium transmitted from the medium-transmitting section so as to generate vapor; a vapor-jetting section for jetting the vapor toward a portion to be cleaned; and a suction section disposed in the vicinity of the vapor-jetting section in such a manner as to face the portion to be cleaned, and adapted to draw in dirt loosened on the portion to be cleaned.

In this case, vapor is jetted toward a portion to be cleaned, and dirt loosened on the portion to be cleaned is drawn in, thereby eliminating the need to wipe off dirt loosened by means of vapor with a towel or the like and thus simplifying cleaning work.

Preferably, the cleaner of the present invention further comprises a vacuum generator for generating a vacuum.

The cleaner draws in the dirt via the suction section by operating the vacuum generator.

Preferably, the suction section is connected to a dust box removably attached to a body of the cleaner, and draws in the dirt by drawing in air; and the drawn-in air is led into a space within the dust box.

Preferably, the air led into the space within the dust box is

separated into dirt-laden water and dirt-free air by a filtering device; and the dirt-laden water is collected in the dust box.

Preferably, the cleaner of the present invention further comprises a discharge port located in the vicinity of the vapor-jetting section and adapted to discharge a drying medium toward the portion to be cleaned.

Preferably, the drying medium is formed through heating the dirt-free air separated by the filtering device.

Preferably, the discharge port is connected to an air-heating path; and the dirt-free air is heated in the air-heating path.

Preferably, the heating section and a vapor transmission pipe for sending the vapor to the vapor-jetting section are disposed in the air-heating path.

Preferably, a brush is disposed adjacent to the vapor-jetting section.

Preferably, a handle is removably attached to a body of the cleaner in order to allow the cleaner to be used in a manner similar to mopping.

BRIEF DESCRIPTION OF THE DRAWINGS

The structure and features of the cleaner according to the present invention will be readily appreciated as the same becomes better understood by referring to the drawings, in which:

FIG. 1 is a sectional view of a cleaner according to an embodiment of the present invention;

FIG. 2 is a rear view of the cleaner of the embodiment;

FIG. 3 is a bottom view of the cleaner of the embodiment;

FIG. 4 is a view showing the state of attachment of a handle pipe in the present embodiment; and

FIG. 5 is a diagram showing a control circuit in the present embodiment.

DESCRIPTION OF THE PREFERRED EMBODIMENT

An embodiment of the present invention will next be described in detail with reference to the drawings.

FIG. 1 is a sectional view of a cleaner according to an embodiment of the present invention; FIG. 2 is a rear view of the cleaner of the embodiment; FIG. 3 is a bottom view of the cleaner of the embodiment; and FIG. 4 is a view showing the state of attachment of a handle pipe in the present embodiment.

In FIGS. 1 to 4, reference numeral 11 denotes a cleaner. The cleaner 11 includes a body 12; a dust box 13 removably attached to a front portion (a left-hand portion in FIGS. 1 and 3) of the body 12 and adapted to collect dust; and a first handle 14 removably attached to the rear end of the body 12 and adapted to allow the cleaner 11 to be used in a manner similar to mopping.

The cleaner 11 includes a pair of first wheels 15 provided at a front portion (a left-hand portion in FIGS. 1 and 3) of the bottom of the cleaner 11 and a pair of second wheels 16 provided at the rear end (the right-hand end in FIGS. 1 and 3) of the bottom. Rotation of the

first and second wheels 15 and 16 allows movement of the cleaner 11 on the floor. The cleaner 11 includes a second handle 20, which serves as a member to be held with the hand, swingably provided on an upper portion of the body 12. When an operator is to use the cleaner 11 while carrying the cleaner 11, he/she raises and holds the second handle 20 .

By means of steam, which is used as vapor, the thus-configured cleaner 11 can remove dirt from an unillustrated portion of a wall, a floor, window glass or the like to be cleaned. In operation, an operator selects an operation mode by means of an unillustrated first mode selector switch and an unillustrated second mode selector switch. The second mode selector switch is provided on the first handle 14 at a predetermined position. The first mode selector switch is provided on the second handle 20 at a predetermined position. The first and second mode selector switches allow an operator to run the cleaner 11 in the dirt removal mode, which is a first operation mode, for loosening dirt on a portion to be cleaned by means of steam, or in the dirt collection mode, which is a second operation mode, for collecting loose dirt. The first and second mode selector switches constitute a mode selector.

The body 12 houses a tank 21, which serves as a cleaning-medium-containing section, adapted to contain water serving as a cleaning medium; a filter 22, which serves as a first filtering device, disposed underneath the tank 21 and adapted to filter water discharged from the tank 21; a pump 23, which serves as a medium-transmitting section, adapted to draw in water discharged from the filter 22 and to discharge water for transmission of water; a heater 24, which serves as a heating

section and a vapor-generating section, adapted to receive and heat water transmitted from the pump 23 for generation of steam; a steam transmission pipe 25 made of silicone rubber and adapted to transmit steam generated by means of the heater 24; and a metallic jet nozzle 26, which serves as a vapor-jetting section, adapted to jet, toward a portion to be cleaned, steam that has been transmitted through the steam transmission pipe 25. The filter 22, the heater 24, the steam transmission pipe 25, and the jet nozzle 26 are disposed in the vicinity of the bottom of the body 12. The filter 22 is disposed in such a manner as to be removable from the bottom side of the body 12. The jet nozzle 26 is disposed such that its distal end is exposed toward and located in the vicinity of the portion to be cleaned. A plurality of jet ports 27 each having a small cross-sectional area are formed in the distal end of the jet nozzle 26. The jet ports 27 are formed in such a manner as to face the portion to be cleaned, and are arranged at predetermined intervals.

Water contained in the tank 21 is discharged at a constant rate; is filtered through the filter 22; is drawn in the pump 23; and is then transmitted to the heater 24. Subsequently, the heater 24 heats the water to thereby generate steam having a temperature of about 100 ℃. The steam is sent to the jet nozzle 26 through the steam transmission pipe 25 and is then jetted toward the portion to be cleaned from the jet nozzle 26.

Incidentally, when steam is jetted toward a portion to be cleaned from the jet nozzle 26, dirt on the portion to be cleaned is

loosened by virtue of a cleaning action of steam. In this connection, the body 12 further houses a suction device 30, which serves as a vacuum generator, and a suction nozzle 31, which serves as a suction section. Operation of the suction device 30 generates a vacuum, thereby drawing in dirt loosened on the portion to be cleaned via the suction nozzle 31 and thus collecting the dirt.

In order to achieve such suction and collection of dirt, the suction device 30 is connected to the dust box 13, and includes a motor 41; output shafts 43 and 44 for outputting rotation generated through operation of the motor 41; and first and second fans 45 and 46 attached to the output shafts 43 and 44, respectively. The suction nozzle 31 is disposed in the vicinity of the jet nozzle 26 and, in the present embodiment, is disposed in front of the jet nozzle 26 in the form of a removable attachment. The suction nozzle 31 is disposed such that its one end is exposed toward and in the vicinity of the portion to be cleaned. A slit-like nozzle port 32 is formed at the one end of the suction nozzle 31. The nozzle port 32 is formed in such a manner as to face the portion to be cleaned. The other end of the suction nozzle 31 communicates with a guide path 33, which is formed in such a manner as to extend upward within a space 49 of the dust box 13 from the bottom of the dust box 13. The guide path 33 guides drawn-in dirt into the dust box 13. Therefore, the cleaner 11 eliminates the need to wipe off dirt loosened by means of stream with a towel or the like, thereby simplifying cleaning work.

Brushes 71 are attached to the suction nozzle 31 in the vicinity

of the nozzle port 32; i.e., in front of and to the rear of (in FIG. 3, to the left of and to the right of) the nozzle port 32. Thus, as the cleaner 11 moves, the brushes 71 rub a portion to be cleaned to thereby scrape off loose dirt, whereby the dirt can be effectively drawn in. Furthermore, since the nozzle port 32 is located between the brushes 71, the scraped-off dirt can be reliably drawn in.

The suction nozzle 31 is attached to the body 12 such that the aforementioned one end of the suction nozzle 31 protrudes downward from the bottom of the body 12 by a predetermined amount. The suction nozzle 31 of a certain size is replaced with that of another size according to, for example, the height of the bottom of the body 12 above the floor, so as to modify the amount of protrusion of the suction nozzle 31 for establishing good contact between the brushes 71 and a portion to be cleaned.

In the present embodiment, the brushes 71 are attached to the suction nozzle 31 in front of and to the rear of the nozzle port 32. However, brushes can be provided in front of and to the rear of a row of the jet ports 27 of the jet nozzle 26. In this case, as the cleaner 11 moves, the brushes rub a portion to be cleaned to thereby scrape off dirt from the portion, whereby the dirt can be effectively loosened. Since the jet ports 27 are located between the brushes, the dirt can be reliably scraped off.

The body 12 includes a partition 34 located at a predetermined position. In the body 12, a housing chamber 35 is formed to the rear of the partition 34 and accommodates the tank 21, the filter 22, the

pump 23, the motor 41, the second fan 46, and the like. A substantially L-shaped air flow path 48 is formed between the partition 34 and the dust box 13. The space 49 within the dust box 13 and the air flow path 48 form an air circulation path.

The air flow path 48 includes an air suction path 51 formed vertically along the partition 34, and an air-heating path 52 formed horizontally along the bottom of the body 12. A filter 53, which serves as a second filtering device, is removably disposed between the dust box 13 and the air suction path 51 for the purpose of filtering circulation air. Thus, when the first fan 45 is rotated through operation of the motor 41, air contained in the space 49 is drawn out via the filter 53, whereby a vacuum is generated within the space 49, and thus air present in the vicinity of a portion to be cleaned is drawn in by means of the suction nozzle 31. As a result, dirt loosened on the portion to be cleaned is drawn in by means of the suction nozzle 31 and is then led into the space 49 through the guide path 33.

The first fan 45 is housed in an unillustrated annular case and functions as follows: air is drawn in via an opening formed at the center of the case and is discharged into the air suction path 51 from a discharge port formed in the peripheral edge of the case.

Air drawn in the space 49 is separated into dirt-laden water and dirt-free air by the filter 53. The dirt-laden water is collected in a bottom portion of the dust box 13. The dirt-free air enters the air suction path 51 and is then sent to the air-heating path 52 by means of a centrifugal force generated through rotation of the first fan 45.

Subsequently, the air is heated to a high temperature (about 40 ℃) within the air-heating path 52 by heat radiated from the heater 24 and the steam transmission pipe 25. The thus-heated air is discharged as a drying medium toward a portion to be cleaned from a plurality of discharge ports 55 formed to the rear of the jet ports 27. The discharge ports 55 each assume the form of a slit and are formed adjacent to each other at constant intervals.

Thus, a portion to be cleaned from which dirt has been removed through suction is heated and dried by air discharged from the discharge ports 55. In this case, since the discharge ports 55 are located in the vicinity of the jet nozzle 26, the portion to be cleaned from which dirt has been removed through suction can be effectively heated and dried. Also, since heat radiated from the heater 24 and the steam transmission pipe 25 can be removed, an excessive increase in temperature of the body 12 can be prevented.

In the present embodiment, the nozzle port 32, the jet ports 27, and the discharge ports 55 are formed sequentially in the rearward direction from the front end (left-hand end in FIGS. 1 and 3) of the cleaner 11. However, the arrangement sequence of the nozzle port 32, the jet ports 27, and the discharge ports 55 can be freely modified.

Furthermore, air used to draw in dirt is circulated through the air flow path 48 and is subsequently discharged from the discharge ports 55 so as to be used as a drying medium, and is again used to draw in dirt. Therefore, generation of odor associated with discharge of the air can be prevented.

Meanwhile, the cleaner 11 can be used in a manner similar to mopping; specifically, an operator holds the first handle 14 and moves the cleaner 11 on the floor.

In this connection, in order to allow attachment/detachment of the first handle 14, a handle holder 57 is disposed at the rear end of the cleaner 11 in such a manner as to be pivotable about a shaft sh1 provided at a rear, lower end portion of the cleaner 11. Notably, an unillustrated operation button is provided at the rear end of the cleaner 11. An operator steps on the button when he/she is to attach/detach the first handle 14.

The handle holder 57 includes a case 58; a coupling 59 disposed within the case 58; and a cap 61 removably attached to the upper end of the case 58. When an operator is to attach the first handle 14 to the handle holder 57, he/she removes the cap 61 and engages the first handle 14 with the coupling 59. A housing 62 is formed at the rear end of the body 12 so as to house the handle holder 57 in an upright condition.

Since the housing chamber 35 houses the pump 23 and the motor 41, the pump 23 and the motor 41, when operated, radiate heat. Thus, the motor 41 rotates the second fan 46 to thereby exhaust air from the housing chamber 35 via the handle holder 57 and the first handle 14. Thus, the handle holder 57 and the first handle 14 assume a hollow structure, and the first handle 14 communicates with the open air via a predetermined hole formed in the upper end of the first handle 14. A communication port 60 is formed at a lower end portion of the handle

holder 57 and at a lower end portion of the front wall (left-hand wall in FIG. 1) of the housing 62 so as to allow air flow into the handle holder 57 from the housing chamber 35. Therefore, heat radiated from the pump 23 and the motor 41 can be led into the handle holder 57 via the communication port 60 and can then be released to the open air via the first handle 14, thereby preventing an excessive increase in the temperature of the body 12.

A bumper 63 is attached to the front end of the body 12. When a front end portion (a left-hand end portion in FIGS. 1 and 3) of the cleaner 11 collides with an obstacle during movement of the cleaner 11, the bumper 63 absorbs shock. At the rear end of the body 12 are provided a power switch 65 for turning on/off power to the cleaner 11; a bush 66 for leading out a cord that connects the cleaner 11 and a power supply (a commercial power supply); a window 67 for indicating a water level within the tank 21; and an LED 68, which serves as an indicator for preventing no-load heating.

Next, the control circuit of the thus-configured cleaner 11 will be described.

FIG. 5 is a view showing the control circuit in the present embodiment.

In FIG. 5, reference numeral 65 denotes a power switch, and reference numeral 72 denotes a jack to be connected to/disconnected from an unillustrated power receptacle. A high-temperature thermostat 73, which serves as a first temperature detector, the heater 24, and a thermal fuse 74 are connected in series to the power switch 65. The

thermostat 73 and the thermal fuse 74 are provided in the vicinity of the heater 24. When the power switch 65 is turned on, power to the cleaner 11 (FIG. 1) is turned on; and when the power switch 65 is turned off, power to the cleaner 11 is turned off.

When power to the cleaner 11 is turned on, current flows through the thermostat 73, the heater 24, and the thermal fuse 74, whereby the heater 24 heats water. Detecting the temperature of the heater 24, the thermostat 73 goes on when the detected temperature is 160 ℃ or lower, and goes off when the detected temperature is higher than 160 ℃. As a result, the heater 24 causes generation of steam of about 100 ℃. When the temperature of the heater 24 becomes 220 ℃ due to occurrence of any anomaly or the like in the thermostat 73, the thermal fuse 74 fuses, thereby forcibly stopping supply of electricity to the heater 24.

Reference numeral 76 denotes a main selector switch disposed on the handle holder 57. The main selector switch 76 includes terminals C, H, and M. When the first handle 14 is detached, the main selector switch 76 is brought in a first condition, and the terminals C and H are connected, whereby the power supply is connected to a first mode selector switch 77. When the first handle 14 is attached, the main selector switch 76 is brought in a second condition, and the terminals C and M are connected, whereby the power supply is connected to a second mode selector switch 78. Since the main selector switch 76 is brought in the first condition when the first handle 14 is detached, and is brought in the second condition when the first handle 14 is attached,

usability of the cleaner 11 can be enhanced.

The first mode selector switch 77 is provided on the second handle 20, and the second mode selector switch 78 is provided on the first handle 14. The first and second mode selector switches 77 and 78 each include terminals C, S, and V.

When an operator brings the first or second mode selector switch 77 or 78 to a first condition, the terminals C and S are connected, thereby establishing the dirt removal mode. When the operator brings the first or second mode selector switch 77 or 78 to a second condition, the terminals C and V are connected, thereby establishing the dirt collection mode.

When the dirt removal mode is established, the power supply, a low-temperature thermostat 79, which serves as a second temperature detector, a diode 81, the pump 23, and a no-load heating prevention circuit 82 are connected in series, and the motor (M) 41 is disconnected from the power supply. As a result, the pump 23 is operated, and thus water contained in the tank 21 is transmitted to the heater 24, whereby the heater 24 causes generation of steam.

The generated steam is transmitted to the jet nozzle 26 through the steam transmission pipe 25 and is then jetted toward a portion to be cleaned from the jet nozzle 26, thereby loosening dirt on the portion to be cleaned.

The thermostat 79 is provided in the vicinity of the heater 24 and detects the temperature of the heater 24. The thermostat 79 goes on when the detected temperature of the heater 24 is 110 ℃ or higher,

and goes off when the detected temperature is lower than 110 ℃. Therefore, while the temperature of the heater 24 is not sufficiently high for generating steam, the pump 23 remains inactive. Thus, since water is not transmitted to the heater 24, no water leaks out from the jet nozzle 26.

The no-load heating prevention circuit 82 includes a reed switch 83, which is turned on and off according to movement of an unillustrated float disposed within the tank 21; and the LED 68 and resistor R, which are connected in parallel with the reed switch 83. When a water level within the tank 21 is equal to or higher than a lower limit value, the reed switch 83 is turned on, and the LED 68 is turned off. When the water level drops below the lower limit value, the reed switch 83 is turned off, and the LED 68 is turned on. Therefore, the lit LED 68 notifies an operator that the quantity of water in the tank 21 is small.

When the dirt collection mode is established, the power supply and the motor 41 are connected, and the thermostat 79, the diode 81, the pump 23, and the no-load heating prevention circuit 82 are disconnected from the power supply. As a result, the motor 41 is operated, and thus a vacuum is generated within the space 49, whereby dirt is drawn in through the suction nozzle 31 to thereby be collected. At this time, a portion to be cleaned is heated and dried by means of air discharged from the discharge ports 55.

In the present embodiment, through operation of the first or second mode selector switch 77 or 78, the dirt removal mode or the dirt

collection mode is selectively established. However, the dirt removal-collection mode can also be selected. In the dirt removal-collection mode, the power supply, the thermostat 79, the diode 81, the pump 23, the no-load heating prevention circuit 82, and the motor 41 are connected in series.

Therefore, the pump 23 is operated, and thus water contained in the tank 21 is transmitted to the heater 24, whereby the heater 24 causes generation of steam. The generated steam is transmitted to the jet nozzle 26 through the steam transmission pipe 25 and is then jetted toward a portion to be cleaned from the jet nozzle 26, thereby loosening dirt on the portion to be cleaned. At this time, the motor 41 is operated, and thus a vacuum is generated within the space 49, whereby the dirt is drawn in through the suction nozzle 31 to thereby be collected.

The present invention is not limited to the above-described embodiment. Numerous modifications and variations of the present invention are possible in light of the spirit of the present invention, and they are not excluded from the scope of the present invention.